

WHAT IS CLAIMED IS:

1           1. An apparatus comprising:

2                 a metal alloy surface in contact with a liquid phosphorous precursor  
3                 compound;

4                     said metal alloy having less than 5% nickel.

1           2. The apparatus of claim 1 wherein said metal alloy is a stainless steel  
2                 alloy with at least 15% chromium.

1           3. The apparatus of claim 1 wherein said metal alloy is stainless steel  
2                 having less than 1% nickel.

1           4. The apparatus of claim 1 wherein said metal alloy is one of stainless  
2                 steel alloys 430, 440 and 446.

1           5. The apparatus of claim 1 wherein said phosphorous precursor  
2                 compound is TEPO, TMP or TEP.

1           6. The apparatus of claim 1 wherein said phosphorous precursor is TMP.

1           7. The apparatus of claim 1 wherein said phosphorous precursor  
2                 compound is TEP.

1           8. An apparatus for delivering a liquid phosphorous precursor compound,  
2                 comprising:

3                 a container for holding said liquid phosphorous precursor  
4                 compound;

5                 a conduit for delivering said liquid phosphorous precursor  
6                 compound or a gaseous product of said liquid phosphorous precursor  
7                 compound;

8                 a heating surface coupled to at least one of said container and a  
9                 portion of said conduit;

10 wherein at least a portion of said container or said conduit is  
11 composed of an alloy having less than 5 percent nickel.

1                   9. The apparatus of claim 8 wherein said metal alloy is a stainless steel  
2                  alloy with at least 15% chromium.

1                   10. The apparatus of claim 8 wherein said metal alloy is stainless steel  
2 having less than 1% nickel.

1                   11. The apparatus of claim 8 wherein said metal alloy is one of stainless  
2                   steel alloys 430, 440 and 446.

1                   12. The apparatus of claim 8 further comprising a heater for heating said  
2                   heating surface to a temperature of 160-170 degrees Celsius.

1                   13. The apparatus of claim 8 wherein said apparatus is a bubbler system  
2 for delivering gases to a chemical reaction chamber for semiconductor wafers.

14. The apparatus of claim 8 wherein said apparatus is a boiler system for  
delivering gases to a chemical reaction chamber for semiconductor wafers.

1               15. The apparatus of claim 8 wherein said apparatus is an injection system  
2       for delivering gases to a chemical reaction chamber for semiconductor wafers, and  
3       wherein said portion composed of an alloy is an injection valve.

16. The apparatus of claim 8 wherein said portion composed of an alloy is  
one of a gasket and a seal.

1                           17. The apparatus of claim 8 wherein said phosphorous precursor  
2                           compound is TEPO, TMP or TEP.

18. The apparatus of claim 8 wherein said phosphorous precursor is TMP.

7                   a liquid TEPO, TMP or TEP injection line coupling said container  
8                   to said injection valve;

9                   a carrier gas source line coupled to said injection valve; and  
10                  an outlet line coupling said injection valve to said CVD chamber.

1                  27. The system of claim 26 wherein said stainless steel alloy is one of  
2                  stainless steel alloys 430, 440 and 446.

1                  28. A method for injecting gaseous phosphorous precursor into a CVD  
2                  chamber comprising the steps of:

3                   providing a liquid TEPO, TMP or TEP through an injection valve  
4                   including a metal alloy having less than 10% nickel;

5                   providing a carrier gas through said valve;

6                   creating a pressure differential in said valve; and  
7                   heating said injection valve.

1                  29. The method of claim 28 further comprising the step of heating said  
2                  valve to a temperature of 160-170 degrees Celsius.

1                  30. The method of claim 29 wherein said valve is heated to approximately  
2                  165 degrees Celsius.

1                  31. An apparatus comprising:

2                   a sealer in contact with a liquid phosphorous precursor compound;  
3                   said sealer being a polyamide.

1                  32. The apparatus of claim 31 wherein said phosphorous precursor  
2                  compound is one of TEPO, TMP or TEP.

1                  33. The apparatus of claim 31 wherein said sealer is a shut-off or control  
2                  plug in a valve.

1                  34. The apparatus of claim 31 wherein said sealer is a gasket.

1           19. The apparatus of claim 8 wherein said phosphorous precursor  
2           compound is TEP.

1           20. A liquid flow injection valve for supplying TEPO, TMP or TEP to a  
2           chemical vapor deposition (CVD) chamber comprising:

3           an injection orifice for connecting to a source of liquid TEPO,  
4           TMP or TEP; and

5           a valve outlet for delivering a gaseous mixture generated from said  
6           liquid TEPO, TMP or TEP to said CVD chamber;

7           said injection orifice including a metal alloy having less than 5%  
8           nickel.

1           21. The valve of claim 20 wherein said metal is a stainless steel alloy with  
2           at least 15% chromium.

1           22. The valve of claim 20 wherein said metal is one of stainless steel  
2           alloys 430, 440 and 446.

1           23. The valve of claim 20 further comprising a heater for heating said  
2           valve to a temperature of 160-170 degrees Celsius.

1           24. The valve of claim 20 further comprising a plug in said valve  
2           composed of a polyamide.

1           25. The valve of claim 24 wherein said polyamide is Vespel.

1           26. A liquid injection system for a CVD chamber comprising:  
2           a container for holding liquid TEPO, TMP or TEP;  
3           an injection valve for converting said liquid TEPO, TMP or TEP  
4           into gaseous form, said injection valve having portions in contact with said  
5           liquid TEPO, TMP or TEP composed of a stainless steel alloy having less  
6           than 5% nickel and at least 15% chromium;

1           35. An apparatus for delivering a liquid phosphorous precursor  
2 compound, comprising:

3                 a container for holding said liquid phosphorous precursor  
4 compound;

5                 a conduit for delivering said liquid phosphorous precursor  
6 compound or a gaseous product of said liquid phosphorous precursor  
7 compound;

8                 wherein at least a portion of said container or said conduit includes  
9 a sealer composed of a polyamide.

1           36. The apparatus of claim 35 wherein said sealer is a shut-off or control  
2 plug in a valve.

1           37. The apparatus of claim 35 wherein said polyamide is Vespel.

1           38. The apparatus of claim 35 wherein said apparatus is a bubbler system  
2 for delivering gases to a chemical reaction chamber for semiconductor wafers.

1           39. The apparatus of claim 35 wherein said apparatus is a boiler system  
2 for delivering gases to a chemical reaction chamber for semiconductor wafers.

1           40. The apparatus of claim 35 wherein said apparatus is an injection  
2 system for delivering gases to a chemical reaction chamber for semiconductor wafers,  
3 and wherein said sealer is a plug in an injection valve.

1           41. The apparatus of claim 35 wherein said sealer is a gasket.

1           42. The apparatus of claim 35 wherein said phosphorous precursor  
2 compound is one of TEPO, TMP or TEP.

1           43. The apparatus of claim 35 wherein a portion of said container or said  
2 conduit is composed of a stainless steel alloy having less than 5% nickel.

1           44. An liquid flow injection valve for supplying a liquid phosphorous  
2 precursor source to a chemical vapor deposition (CVD) chamber comprising:

3                 a container of said liquid phosphorous precursor, said liquid  
4 phosphorous precursor being one of TEPO, TMP or TEP;  
5                 an injection orifice for connecting to said container; and  
6                 a valve outlet for delivering a gaseous mixture generated from said  
7 liquid phosphorous precursor compound to said CVD chamber;  
8                 a shut-off or control plug in said valve, said plug being composed  
9 of Vespel.

1           45. A liquid injection system for a CVD chamber comprising:

2                 a container for holding liquid phosphorous precursor compound,  
3 said liquid phosphorous precursor compound being one of TEPO, TMP or  
4 TEP;

5                 an injection valve for converting said liquid phosphorous precursor  
6 into gaseous form, said injection valve having portions in contact with said  
7 liquid phosphorous precursor compound composed of a stainless steel alloy  
8 having less than 5% nickel and at least 15% chromium;

9                 a shut-off or control plug in said injection valve, said plug being  
10 composed of a polyamide;

11                 a liquid phosphorous precursor compound injection line coupling  
12 said container to said injection valve;

13                 a carrier gas source line coupled to said injection valve; and  
14                 an outlet line coupling said injection valve to said CVD chamber.